



National Aeronautics and  
Space Administration

February 15, 1995

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NRA-95-MTPE-01

## RESEARCH ANNOUNCEMENT

GLOBAL TROPOSPHERIC EXPERIMENT  
PACIFIC EXPLORATORY MISSION IN THE TROPICS  
(PEM-TROPICS)

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Proposals Due May 16, 1995

COMPLETED

OK

**GLOBAL TROPOSPHERIC EXPERIMENT  
PACIFIC EXPLORATORY MISSION IN THE TROPICS  
(PEM-TROPICS)**

**NASA Research Announcement  
Soliciting Research Proposals  
For Research Commencing on or  
after September 1, 1995**

**NRA 95-MTPE-01  
Issued February 15, 1995**

**Office of Mission To Planet Earth  
National Aeronautics and Space Administration  
Washington, DC 20546**

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**RESEARCH ANNOUNCEMENT FOR EXPERIMENTAL AND  
THEORETICAL STUDIES AS PART OF THE GLOBAL TROPOSPHERIC  
EXPERIMENT'S PACIFIC EXPLORATORY MISSION IN THE TROPICS  
(PEM-TROPICS)**

This NASA Research Announcement (NRA) solicits research proposals for the experimental investigations and theoretical studies that will compose the Pacific Exploratory Mission in the central and eastern regions of the tropical Pacific Ocean basin (PEM-Tropics). PEM-Tropics will be conducted as part of NASA's Global Tropospheric Experiment (GTE). The GTE is an ongoing element of the Tropospheric Chemistry Program, a Research and Analysis (R&A) program within the Science Division of NASA's Office for Mission to Planet Earth (OMTPE). The long range goal of the GTE is to contribute substantially to scientific understanding of human impacts on the chemistry of the global troposphere (that portion of the atmosphere that lies between the earth's surface and an altitude of approximately 15 km). Changes in chemical composition of the troposphere on a global scale have been well documented during the last two decades and have given rise to considerable concern that these chemical changes in the troposphere, which are expected to increase as population increases and economic activity expands, will lead to changes in the earth's climate. The connection between atmospheric chemical composition changes and climate changes is a major focus of the OMTPE.

NASA has important and unique capabilities with which to study possible changes in the chemistry of the troposphere. The GTE has provided a scientific management structure for bringing these capabilities to bear in the most effective manner. The major thrust of the GTE has been to utilize NASA's large research aircraft, for example the DC-8 and P3-B aircraft based at the NASA Ames Research Center and the NASA Wallops Flight Facility, respectively, to carry multi-instrument payloads into regions of the global troposphere where natural processes and/or human impacts are believed to be particularly significant in effecting chemical composition changes and/or where the troposphere is still relatively unimpacted. These remote regions offer the best opportunity for readily detecting chemical change. Previous missions conducted by the GTE have provided valuable data in such change-sensitive environments as the Amazon rain forest in Brazil, the tropical South Atlantic Ocean, the Alaskan tundra, the northern Canadian wetlands, and the western Pacific Ocean just off the Asian continent. The focus of the GTE has been and is expected to remain on achieving an understanding of the important processes that cause tropospheric chemical change. The GTE also provides a set of snapshots of global tropospheric chemistry as it is today for reference in the future.

The GTE PEM-Tropics mission will utilize both the NASA DC-8 and P3-B aircraft in a coordinated project to study the chemistry of the troposphere over the central and eastern Pacific Ocean with a focus on the tropics. This relatively unexplored region of the troposphere is expected to be one of the cleaner air regions of the world, possibly the cleanest. It is an outstanding "laboratory" for studying the role of nitrogen oxides in tropospheric ozone formation and loss, a problem that has important climate implications. It is expected to yield important new information on chemical changes that are affecting the oxidizing power of the global troposphere and, therefore, the rate at which the global atmosphere can cleanse itself of pollutants emitted into it by human activities. The southern tropical Pacific region, while still quite clean, is experiencing increasing burdens of pollutants transported from long distances from South America and/or from Southeast Asia, Malaysia, Australia and New Zealand for example.

The purpose of this NRA is to solicit proposals for (1) the experimental investigations that will compose the payload to be carried by the two aircraft and (2) for analytical and



process-oriented theoretical studies based on the data to be acquired. Because the meteorological context is quite critical to understanding the chemical data, proposals are also solicited to provide analyses of meteorological information expected to be available from the worldwide meteorological community and instruments aboard the aircraft. The meteorological analyses to be proposed should be directed toward the characterization of the air masses in which the aircraft operate with respect to their origin and transport.

Experimental investigations to be proposed should be based largely on existing capabilities and should be capable of operation aboard the aircraft. They should have detection limits low enough to operate in the clean air environment of the tropical Pacific Ocean basin. Guidance on the performance expected to be required of the experimental investigations can be found in Appendix A. Guidance on the types of experimental measurements that are needed is also provided in Appendix A, based on current understanding of global tropospheric chemistry. The two aircraft are expected to carry somewhat different payloads because of their different altitude ranges and differing objectives assigned to the two aircraft. Experimental investigators may propose for participation aboard one or both aircraft.

The selected experimental and theoretical investigators will form a Science Team that will do final planning for the mission and lead its field implementation. The Science Team will be chaired by one or more Mission Scientists. A Mission Meteorologist will be selected for each of the two airplanes who will be responsible for meteorological forecasting for the flight operations and for providing input on the origins and destinations of the air masses encountered during the flights. Proposals for Mission Scientist(s) and Mission Meteorologist(s) are solicited, but such proposals should be a part of a broader experimental, theoretical, or data analysis proposal to participate in the PEM-Tropics mission.

Theoretical investigations may be proposed for process oriented studies based on the data to be obtained. These investigations are expected to aid understanding of the results and to provide guidance for the detailed implementation of the mission during its operation.

Implementation of the PEM-Tropics mission will require investigators to be at either Wallops Flight Facility or the Ames Research Center during integration of the experiments aboard the aircraft and to travel with the aircraft during the mission. A total of 3-4 months is estimated to be required, of which about 45 days will be required for the mission. The remaining time will be required for integration and off-loading of experiments on the aircraft.

Proposals for extensive instrument development are not solicited by this NRA, nor are proposals that would require extensive model development or the acquisition of significant computer hardware and software in order to complete the proposed investigations. Proposals for ground-based or ship-based experiments that would provide important supporting data for the aircraft investigations are invited, but NASA does not expect to provide research ship support, nor is a long-term ground-based monitoring project a part of the GTE PEM-Tropics mission. Proposals for extensive instrument development, model development, and long term ground based measurements will be non responsive to this NRA and will not be considered. Proposals for experimental investigations that clearly lack the measurement sensitivity that is required (see Appendix A) or that are unsuitable for operation aboard aircraft will also be non responsive and will also not be considered. NASA expects to manage the GTE PEM-Tropics experiment through a project office at the Langley Research Center. Proposals for project management or logistics support will also be non responsive to this NRA and will not be considered.

Participation in this program is open to all categories of domestic and foreign organizations, including educational institutions, industry, nonprofit institutions, NASA research centers, and other government agencies. Applications for participation in this program can be made through submission of a proposal to the Science Division of OMTPE, National Aeronautics and Space Administration Headquarters, Washington, DC. After a review and evaluation of the proposals received, a selection of the experimental and theoretical investigations to be supported will be made by the Director of the Science Division. Financial support of the selected investigations will be provided by NASA. The initial proposal review will be conducted from mid-May through July, 1995, with selection anticipated in August, 1995. To allow adequate time for evaluation and selection, proposals must be submitted by May 16, 1995. Participation by non-U.S. investigators is encouraged within the specific guidelines outlined in Appendices B & C.

Funds for this GTE PEM-Tropics project have not yet been appropriated. NASA expects to carry out this project within current guidelines for the OMTPE R&A program without any enhancements to those funds. The total cost of the GTE-PEM Tropics project is estimated to be \$12 million dollars over a three year period, including preparation for the project, execution of the field measurements phase, and post mission analysis of the data.

Important guidelines specific to this Research Announcement can be found in Appendix B, including detailed instructions on submission of estimates for travel expenses, shipping costs, and other expenses incidental to participation in a large project to be conducted in the field and aboard aircraft. Information can also be found in Appendix B on how to obtain information about the DC-8 and P3-B aircraft capabilities and the requirements for experiments operated aboard them.

Appendix C contains general instructions for responding to NASA Research Announcements. Prospective investigators should submit proposals stating their objectives, scientific rationale, methodology, management approach, and staffing and funding requirements.

Prospective investigators are urged to read the information in the Appendices carefully and to follow the specific guidelines therein carefully. Proposals should be made for the period of time necessary to carry out the investigation, but awards will generally not be made for a length of time greater than three years.

Identifier      NRA-95-MTPE-01

Proposals may be submitted by mail to:

Tropospheric Chemistry Program  
Code YSP-44 (REF: GTE/PEM-TROPICS)  
National Aeronautics and Space Administration  
300 E Street SW  
Washington DC 20546  
USA

Proposals sent by express or commercial delivery service should substitute 20024 for the above ZIP code. Proposals from outside the United States of America should be submitted according to the information in appendix B, Section VIII.

Selecting Official: Director, Science Division, OMTPE

Additional technical information may be obtained from:

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Manager, Tropospheric Chemistry Program  
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Your interest and cooperation in participating in this opportunity are appreciated.

*Charles Kennel*

C.F. Kennel  
Associate Administrator for  
Mission to Planet Earth

Enclosures: Appendix A, "Technical Description of the Pacific Exploratory Mission-  
Tropics"  
Appendix B, "Amendatory Guidance to the General Guidelines..."  
Appendix C, "Guidelines for Responding..."  
Required Declarattions (3).

## APPENDIX A: TECHNICAL DESCRIPTION OF THE PACIFIC EXPLORATORY MISSION-TROPICS

For global tropospheric chemistry, the Pacific Basin troposphere is a very large chemical reaction vessel. From Peru to Borneo it is 17,700 km in the east-west direction, and from the southern ice shelf to Alaska it is 13,300 km. It covers 35% of the total surface area of the earth and 50% of the ocean surface. Much of the Pacific Basin is remote from continental influence, and hence provides a particularly sensitive indicator of the global-scale impact of human activity on the chemistry of the troposphere. A major contributor to this impact has been studied by recent Global Tropospheric Experiment (GTE) Pacific Exploratory Missions (PEM-West A and B), which investigated several important aspects of the Asian continental outflow over the Northwestern Pacific.

One of the most important issues in global tropospheric chemistry is the sensitivity of the oxidizing power of the troposphere to human influence. Oxidation by the hydroxyl radical (OH) in the troposphere is the main sink for a number of gases important for climate change and stratospheric O<sub>3</sub> depletion, including methane, methyl bromide, methyl chloroform, and hydrochlorofluorocarbons (HCFC's). A decrease in tropospheric OH would increase the tropospheric concentrations of these gases, and increase their fluxes into the stratosphere. Concentrations of OH in the troposphere are determined by a number of photochemical reactions involving O<sub>3</sub>, nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), methane (CH<sub>4</sub>), and non-methane hydrocarbons (NMHC's). Ozone, the primary precursor of OH, is supplied to the troposphere by transport from the stratosphere, and is also produced within the troposphere by photochemical oxidation of CH<sub>4</sub>, NMHC's and CO in the presence of NO<sub>x</sub>. Anthropogenic emissions of NO<sub>x</sub>, CH<sub>4</sub>, NMHC's, and CO could potentially have a large effect on the oxidizing power of the troposphere, directly by affecting OH and indirectly by providing a source of O<sub>3</sub>.

Tropical regions play a critical role in determining the global oxidizing power of the atmosphere because of the high UV and humidity, which promote the formation of OH from reactions that follow the photolysis of O<sub>3</sub>. Previous GTE missions have surveyed the concentrations of O<sub>3</sub> and its precursors over the tropical Atlantic and neighboring continents (ABLE-2A, ABLE-2B, CITE-3, TRACE-A) and over the north tropical Pacific (CITE-2, PEM-West A and PEM-West B). These missions have documented the importance of both natural processes (biogenic emissions, lightning) and anthropogenic processes (biomass and fossil fuel combustion) as sources of NO<sub>x</sub>, NMHC's, and CO in the tropical troposphere. There is a pressing need to conduct a similar mission over the tropical South Pacific, a region of the tropical troposphere where O<sub>3</sub> chemistry may still be dominated by natural processes. Anthropogenic perturbation of the tropical troposphere is expected to increase greatly over the next decades, as a result of population growth and industrial development, and it is important to provide a present-day baseline against which future change can be evaluated.

There is also a need to improve our understanding of atmospheric sulfur chemistry over the Pacific. Sulfate aerosol affects the earth's radiative balance both through direct back scattering of solar radiation and indirectly as cloud condensation nuclei (CCN). CCN, themselves products of aerosol growth processes, are believed to have their origin in nucleation processes involving gas phase H<sub>2</sub>SO<sub>4</sub>, the latter species being produced from the oxidation of SO<sub>2</sub> by OH. Sulfate and SO<sub>2</sub> over the Pacific may originate from a number of sources including long-range transport of anthropogenic pollution, marine biogenic releases of dimethylsulfide (DMS), and volcanic emissions. The relative contributions of these sources over different regions of the Pacific are still poorly known,



representing a serious limitation in our ability to evaluate the role of sulfur in global climate change.

PEM-Tropics will be a two-aircraft mission that will provide the first detailed survey of tropospheric chemistry over the South Pacific Basin (Figure 1). Existing data for this region are sparse, reflecting the difficulty of access. The GAMETAG aircraft missions in 1977 and 1978 provided some early data over the western part of the Basin; they were, however, restricted by the low ceiling and limited endurance of the aircraft used, and also by the state-of-the-science of the instruments available at the time. The more recent STRAT0Z III and PEM-West(A) and (B) missions provided detailed data along the South American and Asian rims of the South Pacific Basin, respectively. Ozone sonde and CO measurements have been made at Samoa for a number of years. Additional observations have been made from island sites (SEAREX program) and from ships. Even so, there are virtually no data for the southeast quadrant of the Basin extending from the international dateline to the South American coast.

It is clear from the few observations available that the South Pacific Basin is particularly remote from human influence. Concentrations of  $\text{NO}_x$ , CO, NMHC's, and other trace gases of continental origin over the Pacific Ocean are often unusually low compared to other regions. Tropospheric ozone column densities are the lowest in the world, with values as low as one third those in other regions of the tropics. The South Pacific Basin likely represents the cleanest region of the tropical troposphere, making a detailed baseline survey of great importance.

PEM-Tropics has two major objectives:

- 1) To provide baseline data over the Basin for gases important in controlling the oxidizing power of the atmosphere including ozone,  $\text{H}_2\text{O}$ , NO, CO, and NMHC's;
- 2) To understand the factors controlling the concentrations of these gases, and to assess the resulting sensitivity of the oxidizing power of the atmosphere to anthropogenic and natural perturbations.

In addition, PEM-Tropics has three secondary objectives:

- 1) To survey the concentrations of aerosol precursors and ultra fine aerosol particles over the South Pacific Basin;
- 2) To improve our understanding of sulfur gas-to-particle formation over the region;
- 3) To provide detailed latitude-altitude transects of long-lived gases for the evaluation of global tropospheric models.

PEM-Tropics is presently scheduled for August-October 1996. The two aircraft platforms available for PEM-Tropics are a DC-8 and a P3-B. The DC-8 will survey the central and westerly portions of the South Pacific Basin while the P3-B surveys the easterly portion.

As the mission is presently envisioned, the two aircraft will cover an area extending zonally across the entire Pacific Basin and meridionally from Hawaii to south of New Zealand (Figure 1). They will provide significant coverage of the Walker circulation cell over the Pacific Basin including the upwelling region over the western equatorial Pacific,

the subsiding region offshore of South America, and the connecting atmosphere in between. Much emphasis will be placed on vertical profiling to obtain as complete a 3-dimensional picture of trace gas concentrations as possible.

Measurement requirements for experiments aboard the DC-8 and the P3-B are given in Tables 1a and 1b, respectively. Priority ratings (1-5) for each measurement are based on our current understanding of the importance of the respective measurement for addressing the mission objectives, as well as some reflection on the current state-of-the-science of available instrumentation. The definition of the priority ratings are given at the end of Table 1.

The aircraft preliminary flight plans are given in Table 2. Both aircraft begin with a ferry flight from NASA-Ames to Hawaii. The DC-8 will fly from Hawaii directly to Tahiti. The P3-B will transit through Christmas Island, where it will carry out two sorties, before meeting the DC-8 in Tahiti. The transect from Ames to Tahiti via Hawaii will include substantial vertical profiling to document interhemispheric gradients of gases.

A number of sorties are planned for the DC-8 and the P3-B out of Tahiti. Two of these sorties will be done in tandem. From Tahiti both the DC-8 and the P3-B will proceed to Easter Island for additional sorties and for investigation of the South American outflow into the South Pacific Basin. The P3-B will then travel to Antofagasta and from there follow the west coast of South America, documenting continental outflow. The Antofagasta-Guayaquil leg of the P3-B will be planned together with a DC-8 sortie northeast out of Easter Island to document the photochemical aging of the continental outflow over a time scale of a few days. From Guayaquil, the P3-B will fly to Costa Rica to examine interhemispheric exchange and the biosphere-rich oceanic region near the equator. A sortie westwards from Costa Rica will be made to sample air on both sides of the intertropical convergence zone. The P3-B will then return to the Wallops Island Flight Facility. After completing the sortie flights from Easter Island, the DC-8 will fly to Christchurch, New Zealand via Tahiti. Two sorties out of Christchurch will explore southern latitudes, both to increase the overall latitudinal coverage of the mission and to investigate stratospheric intrusions with possible influence on the tropical troposphere. From Christchurch the DC-8 will fly to Fiji, where two sorties are planned to sample continental outflow. The DC-8 will then return to Ames via Tahiti.

The information presented in this Appendix is for broad guidance only. The selected investigators will be organized into a Science Team, which will develop the final detailed mission plans that would best achieve the primary and secondary objectives of this mission as given above.

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The following references to publications from past GTE missions and selected other studies of tropospheric chemistry are not intended to be all-inclusive, but may be helpful to potential respondents to this NRA by indicating the types of measurements and analyses that have been done in the past.

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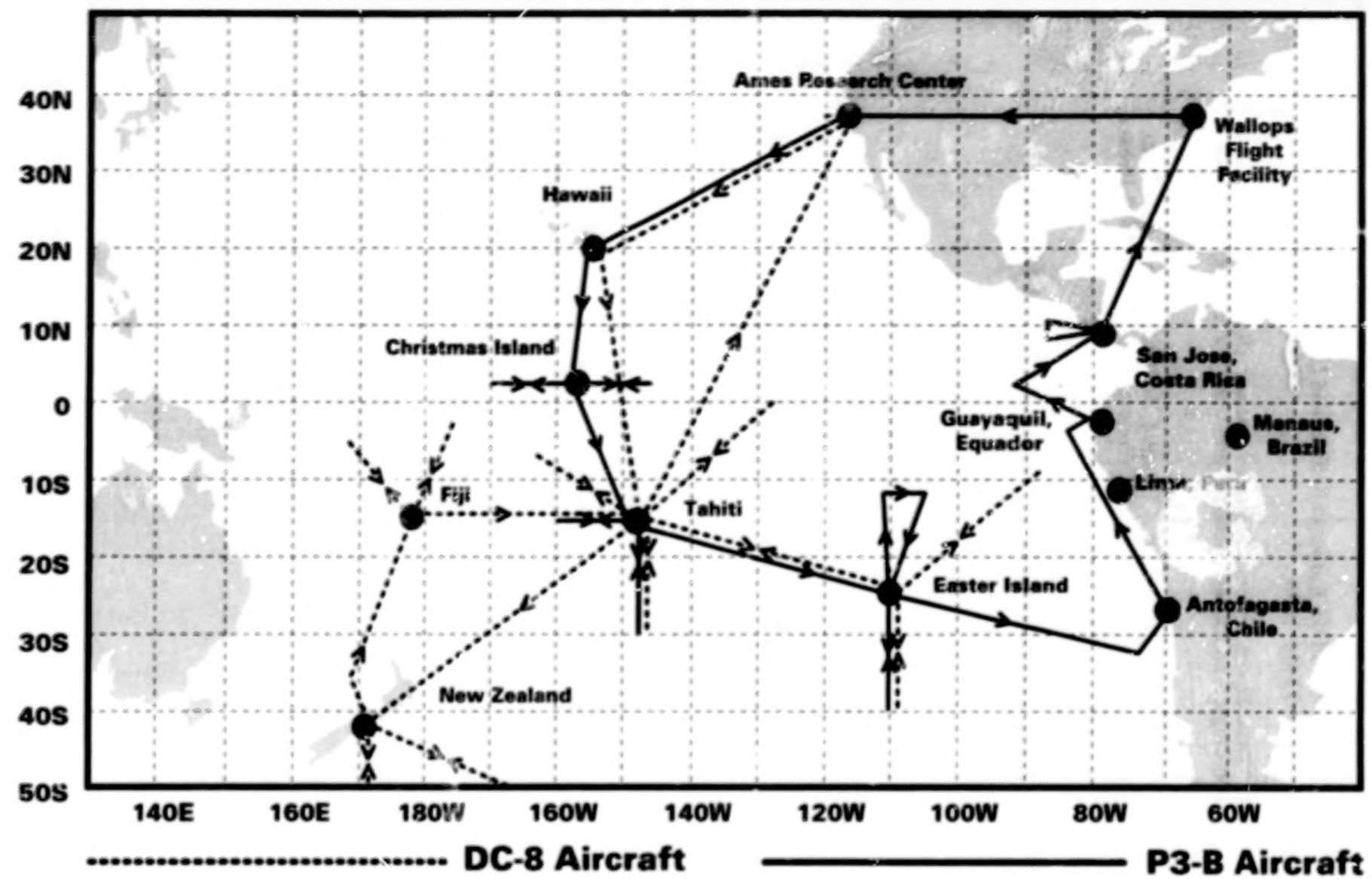


Figure 1: Nominal flight tracks for the DC-8 and P3-B Aircraft during PEM-Tropics

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Table 1a Measurement Requirements for the PEM-Tropics DC-8 Payload				
Species/Parameter	Priority	Detection Limit	Time Resolution	Time Resolution 5 X LOD
O <sub>3</sub> (in situ)	1	3 ppbv	30 sec	5 sec
NO	1	3 pptv	1 min	10 sec
H <sub>2</sub> O (+)	1	3 ppmv	1 min	10 sec
CO	1	5 ppbv	1 min	10 sec
UV radiometer (+)	1	1 watt/m <sup>2</sup>	10 sec	10 sec
atmospheric state parameters (+)	1	aircraft standard	1 sec	1 sec
PAN	2	10 pptv	5 min	5 min
Storm Scope (+)	2	range 400 km	<3 min hold time	
HNO <sub>3</sub>	2	10 pptv	15 min	5 min
J(O <sup>1</sup> D)	2	2 X 10 <sup>-6</sup> /s	1 min	1 min
H <sub>2</sub> O <sub>2</sub>	2	10 pptv	5 min	5 min
CH <sub>3</sub> OOH	2	20 pptv	5 min	5 min
J(NO <sub>2</sub> )	2	1 X 10 <sup>-4</sup> /s	1 min	1 min
NMHC's (C <sub>2</sub> -C <sub>6</sub> )	2	20 pptC	10 min	10 min
halocarbons	2	2 pptv	10 min	10 min
remote ozone (nadir and zenith)	2	5 ppbv	Z≤600m X≤100k	Z≤600m X≤100k
remote aerosol (nadir and zenith)	2	scattering ratio 1 @ 1 μm	Z≤100m X≤500m	Z≤100m X≤500m
NO <sub>y</sub>	3	20 pptv	1 min	10 sec
aerosols (PMS probe or equivalent)	3	50/cm <sup>-3</sup> (0.3-0.6 μm)	10 sec	10 sec
CO <sub>2</sub>	3	0.5 ppmv (precision)	1 min	1 min
N <sub>2</sub> O	3	0.5 ppbv (precision)	1 min	1 min
CH <sub>4</sub>	3	20 ppbv (precision)	1 min	1 min

<b>Table 1a (continued)</b>				
<b>SO<sub>2</sub></b>	<b>3</b>	<b>5 pptv</b>	<b>5 min</b>	<b>5 min</b>
<b>winds (drop wind-sonde) (+)</b>	<b>3</b>	<b>1 m/s</b>	<b>200m(vert ical)</b>	<b>200m(vert ical)</b>
<b>CH<sub>2</sub>O</b>	<b>3</b>	<b>50 pptv</b>	<b>5 min</b>	<b>1 min</b>
<b>ultra fine aerosols</b>	<b>3</b>	<b>size range 3-10 nm</b>	<b>5 min</b>	<b>5 min</b>
<b>acetone</b>	<b>4</b>	<b>50 pptv</b>	<b>10 min</b>	<b>10 min</b>
<b>CH<sub>3</sub>OH</b>	<b>4</b>	<b>50 pptv</b>	<b>10 min</b>	<b>10 min</b>
<b>organic acids</b>	<b>4</b>	<b>10 pptv</b>	<b>10 min</b>	<b>10 min</b>
<b>NO<sub>2</sub></b>	<b>5</b>	<b>10 pptv</b>	<b>2 min</b>	<b>10 sec</b>
<b>NH<sub>3</sub></b>	<b>5</b>	<b>10 pptv</b>	<b>10 min</b>	<b>2 min</b>
<b>OH</b>	<b>5</b>	<b>1 x 10<sup>5</sup> molec/cm<sup>3</sup></b>	<b>10 min</b>	<b>10 min</b>
<b>organic nitrates</b>	<b>5</b>	<b>6 pptv</b>	<b>30 min</b>	<b>10 min</b>
<b>Range-resolved remote temperature sounding</b>	<b>5</b>	<b>2 K</b>	<b>1 km</b>	
<b>Range-resolved remote water vapor</b>	<b>5</b>	<b>mixing ratio dependent (specify)</b>	<b>2 km</b>	
<b>Range-resolved measurement of other chemical species (listed above)</b>	<b>5</b>	<b>species dependent (specify)</b>	<b>10 min</b>	<b>1 min</b>

(+) To be provided by NASA

**Table 1b. Measurement Requirements for the P3-B Aircraft**

Species/Parameter	Priority	Detection Limit	Time Resolution	Time Resolution 5 X LOD
UV radiometer (+)	1	.10 mwatts/cm <sup>2</sup>	10s	10s
H <sub>2</sub> O (+)	1	3ppmv	1 min	10s
NO	1	3pptv	1 min	1 min
CO	1	5ppbv	1 min	1 min
O <sub>3</sub>	1	3ppbv	1 min	1 min
NMHC's(C <sub>2</sub> -C <sub>6</sub> )	1	20pptC	5 min	5 min
Atmospheric State Parameters (+)	1	N/A	10 sec	10 sec
H <sub>2</sub> O <sub>2</sub>	2	20pptv	5 min	5 min
HNO <sub>3</sub>	2	10-pptv	15 min	5 min
J(O'D)	2	2 x 10 <sup>-6</sup> /s	1 min	1 min
SO <sub>2</sub>	2	5pptv	5 min	5 min
H <sub>2</sub> SO <sub>4</sub> (g)	3	2 x 10 <sup>5</sup> molec/cm <sup>3</sup>	5 min	1 min
DMS	3	1pptv	5 min	5 min
J(NO <sub>2</sub> )	3	1 x 10 <sup>-4</sup> /s	1 min	1 min
Remote Aerosol (nadir and zenith)	3	Scattering Ratio 1 @ 1um	Z ≤ 100m X ≤ 500 km	Z ≤ 100m X ≤ 500 km
Remote Ozone (nadir and zenith)	3	5ppbv	Z ≤ 600m X ≤ 100 km	Z ≤ 600m X ≤ 100 km
Storm Scope (+)	3	range 400km	<3 min holding time	
Ultra Fine Aerosol	3	size range 3-12nm	5 min	5 min
Size/number resolved aerosol	3	size range .03-.75μ	6 min	6 min
NSS Sulfate	3		20 min	10 min
CH <sub>2</sub> O	4	50pptv	5 min	5 min
CH <sub>4</sub>	4	.02ppmv	1 min	1 min
CO <sub>2</sub>	4	.5ppmv	1 min	1 min
CH <sub>3</sub> OOH	4	20pptv	5 min	5 min
Nitrate aerosol	4		20 min	10 min
Acetone	4	50pptv	10 min	10 min

Table 1b Continued				
Methanol	4	50pptv	10 min	10 min
Organic Acids	4	20pptv	20 min	10 min
PAN	4	10pptv	5 min	5 min
NH <sub>3</sub>	5	5pptv	1 min	1 min
MSA(g)	5	$5 \times 10^5$ molec/cm <sup>3</sup>	5 min	1 min
DMSO(g)	5	$5 \times 10^6$ molec/cm <sup>3</sup>	5 min	1 min
OH	5	$2 \times 10^5$ molec/cm <sup>3</sup>	5 min	1 min
NO <sub>2</sub>	5	5pptv	1 min	1 min
NO <sub>y</sub>	5	10pptv	1 min	1 min

(+) To be provided by NASA

Table 1 (concl.) PEM-Tropics: Instrument Priority Definitions

Rating	Description	Meaning
1	Mission Critical	The measurement is essential to the interpretation of data related to the primary objectives of mission.
2	Very Important	The measurement is important to several scientific issues being addressed by the mission.
3	Important	The measurement is important to some scientific aspects of the mission. Rack/space requirements of instrument will be a prime consideration in selection
4	Less Important	Measurements could be useful but information not considered critical to interpretation of mission results. Instruments will be included only on a space available basis and generally, only as an ancillary measurement on a higher priority instrument.
5	Speculative	Measurements are either speculative in nature or involve instruments that represent the application of new technologies to measuring species of high scientific interest. Major consideration will be given to having at least one measurement of this type on each mission.

Table 2. Nominal Schedule for the DC-8 and P3-B Aircraft During PEM-Tropics

Combined Project Day #	DC-8	P3-B
1		Wallops-Ames (9)+
2*	Test Flight #2 (5)+	Ames-Hickam (10)
3		No fly
4		No fly
5	Test Flight #3 (5)	No fly
6		Hickam-Christmas Is. (8)
7		No fly
8		No fly
9		Christmas Is. (West) (8)
10	Ames-Hickam (7)	No fly
11	No fly	Christmas Is. (East) (10)
12	No fly	No fly
13*	Hickam-Tahiti (10)	Christmas-Tahiti (8)
14	No fly	Down
15	No fly	No fly
16	No fly	No fly
17*	Tahiti (south) (8)	Tahiti (south) (8)
18	No fly	No fly
19*	Tahiti (west) (7.5)	Tahiti (west) (8)

**Table 2. Nominal Schedule for the DC-8 and P3-B Aircraft During  
PEM-Tropics (Continued)**

<u>Combined Project Day #</u>	<u>DC-8</u>	<u>P3-B</u>
20	No fly	No fly
21	Tahiti (northeast) (7.5)	Tahiti-Easter Is. (10)
22	No fly	No fly
23	Tahiti-Easter Is. (8)	No fly
24	No fly	Easter (north) (8)
25	No fly	No fly
26*	Easter Is. (south) (8)	Easter Is. (south) (8)
27	Down	No fly
28	No fly	Easter Is.-Chile (10)
29*	Easter Is. (northeast) (8)	Chile-Ecuador (8)
30	No fly	Down
31	Easter Is.-Tahiti (7)	No fly
32	No fly	No fly
33	Tahiti-Christchurch (10)	Ecuador-Costa Rica (10)
34	No fly	No fly
35	No fly	Costa Rica (local) (8)
36	Christchurch (local) (10)	No fly
37	No fly	Costa Rica-Wallops (7)
38	Christchurch (local) (8)	Off Load
39	No fly	OffLoad
40	Christchurch-Fiji (8)	
41	No fly	
42	No fly	
43	Fiji (north) (8)	
44	Down	
45	No fly	
46	Fiji (northeast) (8)	
47	No fly	
48	Fiji-Tahiti (10)	
49	No fly	
50	Tahiti-Ames (9)	

\* Coordinated flights

+ (Nominal Flight Hours)



## **APPENDIX B: AMENDATORY GUIDANCE TO THE GENERAL GUIDELINES CONTAINED IN APPENDIX C APPLICABLE ONLY TO THIS NRA**

### **PROPOSAL CONTENT, SUBMISSION AND EVALUATION INFORMATION**

#### **I. PURPOSE**

These guidelines contain general and specific information regarding the submission of proposals in response to this NRA. Suggested formats and mailing information for submission of proposals for research related to this program are also provided. Appendix C contains general instructions for responding to NASA Research Announcements. Where conflicts exist between this Appendix and Appendix C, this appendix shall be the controlling document.

#### **II. GUIDELINES FOR PARTICIPATION**

This Research Announcement solicits proposals for experimental investigations aboard either the DC-8 or P3-B aircraft or both that address the objectives of the PEM-Tropics mission as set forth in Appendix A. It also solicits proposals for theoretical investigations and data analysis to be performed with the data that will be acquired. Proposals are also solicited for the roles of mission scientist(s) and mission meteorologist(s) as defined in this NRA, but such proposals should be submitted only as a part of a broader experimental or theoretical investigation that will address the objectives of the PEM-Tropics mission.

Proposals for experimental investigations that would require extensive instrument development are not solicited, nor are proposals for extensive model development or the acquisition of major computer hardware and software. Proposals for project management or logistics support are also not solicited by this NRA.

Proposals for ground-based and ship based investigations that would support the objectives of PEM-Tropics may be submitted, but NASA does not expect to provide research ship support or to establish a long-term ground-based monitoring capability under this NRA. Proposals in these areas need, therefore, to take advantage of existing facilities or facilities that might be provided by other agencies or other governments at the time and place of the PEM-Tropics aircraft operations.

Participation is open to all categories of domestic and foreign organizations, but non-U.S. proposals will not be eligible to receive NASA funding, except that NASA will integrate selected foreign experiments onto the appropriate aircraft and will pay all costs associated with operation of the aircraft.

#### **III. SCHEDULE**

Proposals that are to be considered under this NRA are due at NASA Headquarters by May 16, 1995. The review of these proposals will be completed during June and July, 1995. Funding is anticipated to begin on or after September 1, 1995. Late proposals will be considered only if the selecting official deems them to offer NASA a significant technical advantage or cost reduction.

#### IV. GENERAL INFORMATION ON GTE AND PEM-TROPICS

This section provides information on the management structure and functions of the GTE Project Office, which may impact the development and costing of research proposals.

##### A. Program Management

The PEM-Tropics will be a research project within the NASA Global Tropospheric Experiment, managed and funded through the Tropospheric Chemistry Program in the Office for Mission to Planet Earth (OMTPE). The Program Manager for the Tropospheric Chemistry Program will serve as the PEM-Tropics Program Manager providing oversight to ensure that the research activities of PEM-Tropics are in concert with the objectives of the OMTPE. The Program Manager will be the point of contact for coordinating the research activities of PEM-Tropics with other collaborating U.S. and foreign agencies. The Program Manager will be an *ex officio* member of the PEM-Tropics Science Team.

##### B. Project Management

The PEM-Tropics project activities will be managed by the GTE Project Office at NASA's Langley Research Center (LARC). The GTE Project manager will be responsible for the overall management and coordination of resources provided to meet the scientific objectives of the PEM-Tropics mission. These responsibilities will include (a) interaction with the Tropospheric Chemistry Program management and the management of other collaborating agencies and science teams; (b) overall direction of project planning, schedules, and field operations; (c) providing for the timely transmittal of all data collected by the project into a public archive at LARC; and (d) acquisition and reporting of base measurements in support of the mission goals. The Project Manager will be assisted by the Mission Scientist(s) and Mission Meteorologist(s) and by a project staff. The Project manager will be an *ex officio* member of the PEM-Tropics Science Team.

##### C. PEM-Tropics Science Team

The PEM-Tropics Science Team will be composed of (1) the Principal Investigators for experimental proposals approved for the DC-8 and/or of the P3-B components of the mission, (2) any ground-based principal investigators that may be selected, and (3) the selected theoretical investigators. The term of participation on the Science Team will continue as long as the approved research continues.

The Science Team will be co-chaired by the mission scientist(s) for the DC-8 and the P3-B components. Individuals proposing an experimental or theoretical investigation may also propose to serve as Mission Scientist for either or both aircraft teams.

The Science Team will determine its own structure and method for interactions among team members and the DC-8 and P3-B aircraft operators to achieve overall the mission objectives and the goals of the GTE PEM-Tropics mission. The Science Team and the Project Manager will develop detailed plans to conduct the PEM-Tropics mission to meet the objectives given in this NRA. The Science Team will also be responsible for establishing a data management and data protocol plan that will promote the timely publication and dissemination of scientific results in accordance with data handling policies of the OMTPE, which generally require that data from OMTPE projects be made available to the public after a brief period of exclusive use by science teams for validation

of the data. A period of approximately six months for this purpose is envisioned for the PEM-Tropics mission.

#### **D. National and International Cooperation**

The PEM-Tropics project will welcome international participation in all of its field studies, coordinated through the International Global Atmospheric Chemistry (IGAC) project, a core project of the International Geosphere Biosphere Program (IGBP). The PEM-Tropics mission is currently an active GLOCHEM Mission within IGAC. Foreign participation or collaboration will be on a cooperative (no exchange of funds) basis only. Foreign experiments accepted will be integrated by NASA onto the appropriate aircraft, and NASA will bear all costs of operating the aircraft. The guidelines for foreign proposal are described in Section VIII of this Appendix.

#### **E. Logistical Support Provided by NASA**

During the field deployment of PEM-Tropics the GTE Project Office will provide the logistical arrangements and the cost for shipping investigator equipment to and from the investigator's laboratory and the aircraft integration site, and to and from the investigator's laboratory and the intensive field deployment sites. For the P3-B aircraft the intensive sites include Christmas Island, Tahiti, Easter Island, and possibly Costa Rica. For the DC-8 the intensive sites include Tahiti, Easter Island, Fiji, and Christchurch, New Zealand. Shipments to each of the intensive sites will be *via* surface transportation.

The Project Office will also obtain hotel accommodations at each deployment site, and meeting rooms and field laboratory facilities as required at each intensive deployment site. The Project Office will also make arrangements for such general items as liquid nitrogen and dry ice.

Travel costs associated with participation of non-NASA U.S. investigators in planning meetings will be provided through the GTE Project Office. Travel costs directly attributed to the field deployment of PEM-Tropics will also be provided through the GTE Project Office for non-NASA U.S. investigators. Travel costs for NASA employees will be covered separately. Shipping costs for all investigations will be covered through the GTE Project Office. In order for the Project Office to estimate the resources that will be required to cover these costs, proposers are requested to provide certain information described in Section I. of this Appendix.

Foreign investigators must bear their own costs for all travel and shipping.

#### **F. Data Products/Archive**

The Project Office will serve as a central repository and distribution center for all data products obtained in the PEM-Tropics mission. Aboard each aircraft the Project Office, in conjunction with the respective aircraft facility coordinators, will provide a set of standard "housekeeping" parameters including ambient temperature, dew point temperature, winds, and aircraft position (see Table 1, Appendix A). The Project Office will provide a data system aboard each aircraft which will facilitate distribution of these data aboard the aircraft in real time and post flight. The project data system will also offer the capability of recording and displaying selected information from investigators aboard the respective aircraft.

The Project Office will also maintain a mission data archive for distribution among the science team. The mission archive will consist of all data acquired a part of the PEM-Tropics mission. Each investigator will be responsible for submitting preliminary field results to the Project Office for distribution to the Science Team during the mission. Final validated results from the mission must be submitted to the Project Office approximately 6 months after completion of the field deployment phase. The project office will be responsible for submitting the PEM-Tropics data archive to the Langley Distributed Active Archive Center, which will be the repository for all of the mission data.

The Project Office, with the Mission Meteorologist, will provide for the acquisition and distribution to the science team meteorological data supporting the mission objectives. These data will include meteorological products for flight planning and post mission products to support analysis and publication of results.

## **V. PROPOSAL CONTENT AND FORMAT**

The content of the proposal should provide sufficient detail to enable a reviewer to assess the value of the proposed research, its relation to the PEM-Tropics objectives, and the probability that the investigators will be able to accomplish the stated objectives within the requested resources. **The technical part of the proposal should be limited to the equivalent of 10 single-spaced typewritten pages.** Additional pertinent information including publications, data, etc., may be added as attachments. Each proposal should contain the following materials assembled in the order given.

- A. Cover Letter:** Each proposal should be prefaced by a cover letter signed by an official of the investigator's organization who is authorized to legally bind the organization to the proposal and its content (unless the signature appears on the proposal itself). The cover letter should refer to the GTE PEM-Tropics Program.
- B. Title Page:** The title page should contain the following:
1. A short descriptive title for the proposed effort.
  2. Name of the proposing organization(s).
  3. Names, full addresses, telephone numbers, and affiliations of the Principal Investigator and all Co-Investigators.
  4. Date of submission.
  5. Total cost.
- C. Abstract Page:** This shall contain a brief statement of the objective of the proposed effort and method of approach.

#### **D. Table of Contents**

#### **E. Description of Proposed Research:**

This section should include:

1. An introduction:

This should clearly define the scientific objectives of the proposed effort. Background material and the scientific justification and rationale for the effort should be included.

2. A description of the proposed work:

This description should be a full statement of work proposed with the key elements clearly identified and related to each other. The methods or approaches to be used should be clearly described and, as appropriate, the advantages of the selected methods or approaches over alternative ones should be discussed. The anticipated results should be identified and their relation to the stated research objectives should be discussed.

3. A discussion of the importance of the anticipated results:

This discussion should be within the context of the goals of this program as outlined in Section II above.

#### **F. Management Approach:**

The Management Plan should outline the specific responsibilities of the Principal Investigator (PI) and all other members of the group, and indicate the relationships of these responsibilities within the group. The Management Plan should also identify modeling tools available to the investigators and computer usage plans. The plan should identify what contractor and/or non-institutional support is anticipated and who will be providing it.

#### **G. Cost Plan: (U.S. proposals only):**

The cost plan should be prepared according to the guidelines of the institution submitting the proposal. Separate budgets should be shown for each year. It should include:

1. Cost estimates for direct labor, including individual staff-months and rates for all personnel.
2. Estimated costs for computer services.



3. Travel costs.

Include only those trips necessary for attendance at scientific meetings, etc. Costs of travel related to field operations and Science Team meetings will be reimbursed through the GTE Project Office. See Section I. for details. The names of all personnel involved in field deployment should be given in an accompanying appendix to the proposal.

4. Overhead rates and costs.

5. Other costs, with explanation.

Itemize items over \$500. Shipping costs should not be estimated here. Instead, estimate shipping requirements as indicated in Section I. Costs for shipping will be reimbursed through the GTE Project Office.

6. Contribution from any cost-sharing plan or other support for the proposed research.

7. Itemized list of the amount of any contractor or other non institutional related activities to be supported as part of the proposed investigation.

8. Current research funding from other sources, including level of the funding and the title or brief description of the supported research.

9. Total cost of support being requested from NASA under this program.

**H. Enclosures:**

Include appropriate descriptions of available facilities, resumes of investigators, bibliographies and such other materials as desired.

**I. Logistical Support Requirements**

All proposals should include an appendix describing and defining in detail the logistical requirements associated with the proposed investigation. As a minimum this appendix should provide information relative to the airborne instrumentation, field personnel required, and shipping. The minimum requirements should be defined in each of the following areas.

1. Airborne Instrumentation

Space, power and weight required by each airborne instrument will be important considerations in the selection of the ensemble of instruments to meet the objectives of the respective components of PEM-Tropics. Each investigation should as a minimum define (1) the amount of rack space that will be required; (2) power required (e.g. 60hz, 400hz and 28vdc); (3) description of inlet probe(s) and/or optical window(s) required; (4) size and number of compressed gas bottles, coolers, pumps, etc. that will required to

be mounted external to the rack space defined in (1) above. As a general guideline one footlocker size container (24x24x40 inches) will be allocated to each investigator team for onboard storage of spare parts. This footlocker, or any other equivalent storage container, can weigh no more than 150 lbs. The proposal should clearly define additional storage space required aboard each aircraft.

Information regarding the size of instrument racks, power, and general operation of instrumentation aboard the DC-8 and P3-B aircraft can be obtained by contacting:

Cris Scofield  
NASA Ames Research Center  
M.S. 211-12  
Moffett Field, CA 94035  
USA

Phone: 415-604-4599  
FAX : 415-604-3885  
e-mail: CScofield@msmail.arc.nasa.gov

for DC-8 information and/or

Dave Pierce  
NASA Wallops Flight Facility  
Mail Code 831.1  
Wallops Island, VA 23336

Phone: 804-824-1448  
FAX : 804-824-1851

for P3-B information.

## 2. Personnel/Travel

The number of individuals required to operate the proposed instrumentation during flight operations, and the number, if any, of additional non-flight personnel required during the field deployment of PEM-Tropics should be defined.

## 3. Shipping

An estimate of the volume and weight of the equipment that will be required at each respective integration site should be provided. In addition, an estimate of the volume and weight of additional equipment or special

items, such as compressed gases, that will be required at each intensive deployment site should be identified.

#### 4. Miscellaneous

Special requirements, such as, the need for liquid nitrogen, dry ice, etc. during the PEM-Tropics deployment should be defined. Other not-standard operating procedures & requirements should also be discussed.

#### J. Certifications

Certifications Regarding Drug-Free Workplace Requirements, Regarding Debarment or Suspension, and Regarding Lobbying are attached, and must be completed.

### VI. EVALUATION CRITERIA

The following criteria replace paragraph 13 of Appendix C, and will be used in decreasing order of importance in evaluating proposals.

1. The overall scientific merit of the investigation, including:
  - (a) The technical feasibility of accomplishing the stated scientific goals of the proposed investigation and
  - (b) The relevance of the proposed research to the PEM-tropics mission's goals and objectives
2. The competence and relevant experience of the principal investigator and any collaborators as an indication of their ability to carry the investigation to a successful conclusion within the requested resources.
3. The reputation and interest of the investigator's institution and the willingness of the institution to provide the necessary support to ensure that the investigation can be completed satisfactorily.
4. The cost of the proposed effort including consideration of the realism and reasonableness of the proposed cost and the relationship of the proposed cost to available funds.

### VII. PROPOSAL SUBMISSION INFORMATION

Ten copies of the proposal should be submitted. One copy should be of a quality suitable for reproduction and bear original signatures. Proposals must be typewritten in English, and they should be sent to:

Tropospheric Chemistry Program  
Code YSP-44 (REF: GTE/PEM-Tropics)  
National Aeronautics and Space Administration  
300 E St. SW  
Washington, DC 20546  
USA



Proposals sent by express or commercial delivery service should substitute 20024 for the above ZIP code.

Foreign proposers should submit an additional copy to the Office of External Affairs, Mission to Planet Earth Division, as indicated in Section VIII.

All proposals must be received before the established closing date; those received after the closing date will be treated in accordance with NASA's provisions for late proposals (FAR Supplement 18-15-412, paragraphs A and B).

## **VIII. FOREIGN PARTICIPATION**

NASA welcomes proposals from entities located outside the U.S. in response to this NRA. Proposals from non-U.S. entities should not unclude a cost plan. Non-U.S. proposals, and U.S. proposals that include non-U.S. participation, must be endorsed by the respective government agency or funding/sponsoring institution in the country from which the non-U.S. participant is proposing. Such endorsement should indicate the following points:

- (1). The proposal merits careful consideration by NASA.
- (2). If the proposal is selected, sufficient funds will be made available by the sponsoring foreign agency to undertake the activity as proposed.

In the case where a foreign proposal is selected, NASA will arrange with the sponsoring foreign agency for the proposed participation on a cooperative (no exchange of funds basis in which NASA and the sponsoring agency will each bear the cost of discharging their respective responsibilities.

Proposals, along with the requested number of copies and Letter of Endorsement, must be forwarded to NASA Headquarters, Code YSP-44 in time to arrive before the deadline established for this NRA (as described on page 30. In addition, one copy of each of these documents should be sent to:

NASA Headquarters  
Office of External Relations  
Mission to Planet Earth Division, Code IY  
300 E Street S.W.  
Washington, Dc 20546  
USA

All non-U.S. proposals will undergo the same evaluation and selection process as those originating in the U.S. Non-U.S. proposals, and U.S. proposals that include non-U.S. participation, must follow all other guidelines and requirements described in this NRA. Sponsoring non-U.S. agencies may, in exceptional situations, forward a proposal without endorsement to the above address, if review and endorsement are not possible before the announced closing date. In such cases, however, NASA's Mission to Planet Earth Division of the Office of External Relations should be advised when a decision on the endorsement is to be expected.

## **IX. REQUIRED CERTIFICATIONS**

Included with this NRA are (1) Form ED 80-0004 "Certification Regarding Drug-Free Workplace Requirements: Grantees Other Than Individual" (2) Form ED GCS-008 (REV. 12/88), "Certification Regarding Debarment, Suspension, and other Responsibility Matters: Primary Covered Transactions", and (3) Form GCS-008 (REV. 12/88), "Certification Regarding Lobbying." One set of these completed forms must be included with the original signature version of all proposals.

## **APPENDIX C: GUIDELINES FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS FOR SOLICITED BASIC RESEARCH PROPOSALS**

(AUGUST 1988)

### **1. Foreword**

a. NASA depends upon industry, educational institutions and other nonprofit organizations for most of its research efforts. While a number of mechanisms have been developed over the years to inform the research community of those areas in which NASA has special research interests, these instructions apply only to "NASA Research Announcements," a form of "broad agency announcements" described in 6.102(d)(2) and 35.016 of the Federal Acquisition Regulation (FAR). The "NASA Research Announcement (NRA)" permits competitive selection of research projects in accordance with statute while at the same time preserving the traditional concepts and understanding associated with NASA sponsorship of research.

b. These instructions are Appendix I to 18-70.203 of the NASA Federal Acquisition Regulation Supplement.

### **2. Policy**

a. NASA fosters and encourages the submission of research proposals relevant to agency mission requirements by solicitations, "NASA Research Announcements," which describe research areas of interests to NASA. Proposals received in response to an NRA will be used only for evaluation purposes.

b. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a preaward synopsis published for individual proposals.

c. A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific requests; however, information or materials that NASA and the awardees mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

### **3. Purpose**

These instructions are intended to supplement documents identified as "NASA Research Announcements." The NRA's contain programmatic information and certain "NRA-specific" requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applied to responses to all NRA's.

### **4. Relationship To Award**

a. A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded on the basis of a proposal submitted in response to an NRA.

NASA does not have separate "grant proposal" and "contract proposal" categories, so all proposals may be prepared in a similar fashion. NASA will determine the appropriate instrument.

b. Grants are generally used to fund basic research in educational and nonprofit institutions, while research in other private sector organizations is accomplished under contract. Additional information peculiar to the contractual process (certifications, cost and pricing data, facilities information, etc.) will be requested, as necessary, as the procurement progresses. Contracts resulting from NRA's are subject to the Federal Acquisition Regulation and the NASA FAR Supplement (NHB 5100.4). Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NHB 5800.1).

## **5. Conformance Of Guidance**

a. NASA does not have any mandatory forms or formats for preparation of responses to NRA's; however, it is requested that proposals conform to the procedural and submission guidelines covered in these instructions. In particular, NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.

b. In order to be considered responsive to the solicitation, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation. NASA reserves the right to reject any or all proposals received in response to an NRA when such action is considered in the best interest of the Government.

## **6. NRA-Specific Items**

a. Several proposal submission items will appear in the NRA itself. These include: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more information.

b. Items included in these instructions may be supplemented by the NRA, as circumstances warrant. Example are: technical points for specific emphasis; additional evaluation factors; and proposal length.

## **7. Proposal Contents**

a. The following general information is needed in all proposals in order to permit consideration in an objective manner. NRA's will generally specify topics for which additional information or greater detail is desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

### **b. Transmittal Letter or Prefatory Material**

(1) The legal name and address of the organization and specific division or campus identification if part of a larger organization;

(2) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;

(3) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;

(4) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;

(5) Identification of any other organizations that are currently evaluating a proposal for the same efforts;

(6) Identification of the specific NRA, by number and title, to which the proposal is responding;

(7) Dollar amount requested of NASA, desired starting date, and duration of project;

(8) Date of submission; and

(9) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself).

**c. Restriction on Use and Disclosure of Proposal Information**

It is NASA policy to use information contained in proposals for evaluation purposes only. While this policy does not require that the proposal bear a restrictive notice, offerors or quoters should, in order to maximize protection of trade secrets or other information that is commercial or financial and confidential or privileged, place the following notice on the title page of the proposal and specify the information subject to the notice by inserting appropriate identification, such as page numbers, in the notice. In any event, information (data) contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

**NOTICE**

**Restriction on Use and Disclosure  
of Proposal Information**

The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal the Government shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

**d. Abstract**

Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective of the proposed effort and the method of approach.

**e. Project Description**



(1) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge in the field; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the general plan of work, including the broad design of experiments to be undertaken and an adequate description of experimental methods and procedures. The project description should be prepared in a manner that addresses the evaluation factors in these instructions and any additional specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Note, however, that subcontracting significant portions of a research project is discouraged.

(2) When it is expected that the effort will require more than one year for completion, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should, of course, be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

#### f. Management Approach

For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and any necessary arrangements for ensuring a coordinated effort should be described. Aspects of any required intensive working relation with NASA field centers that are not logical inclusions elsewhere in the proposal should be described in this section.

#### g. Personnel

The principal investigator is responsible for direct supervision of the work and participates in the conduct of the research regardless of whether or not compensation is received under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the name and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

#### h. Facilities and Equipment

(1) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use on the project.

(2) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative to purchase. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for both research and non-research purposes should be explained.

i. Proposed Costs

(1) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages; fringe benefits; equipment; expendable materials and supplies; services; domestic and foreign travel; ADP expenses; publication or page charges; consultants; subcontractors; other miscellaneous identifiable direct costs; and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all manpower data in terms of man-months or fractions of full-time.

(2) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired; purpose and estimated number and lengths of trips planned; basis for indirect cost computation (including date of most recent negotiation and cognizant agency); and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases (Standard Form 1411 may be used).

(3) Allowable costs are governed by FAR Part 31 and the NASA FAR Supplement Part 18-31 (and OMB Circulars A-21 for educational institutions and A-122 for nonprofit organizations).

j. Security

Proposals should not contain security classified material. However, if the proposed research requires access to or may generate security classified information, the submitter will be required to comply with applicable Government security regulations.

k. Current Support

For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

l. Special Matters

(1) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.

(2) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

**8. Renewal Proposals**

a. Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. It is not necessary that renewal proposals repeat all of the information that was in the original proposal upon which the current support was based. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which extended support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposals should

treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

b. NASA reserves the right to renew an effort either through amendment of an existing contractor or by a new award.

## **9. Length**

Unless otherwise specified in the NRA, every effort should be made to keep proposals as brief as possible, concentrating on substantive material essential for a complete understanding of the project. Experience shows that few proposals need exceed 15-20 pages. Any necessary detailed information, such as reprints, should be included as attachments rather than in the main body of the proposal. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments: Their availability may be mentioned in the proposal.

## **10. Joint Proposals**

a. Some projects involve joint efforts among individuals in different organizations or mutual efforts of more than one organization. Where multiple organizations are involved, the proposal may be submitted by only one of them. In this event, it should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

b. Where a project of a cooperative nature with NASA is contemplated, the proposal should describe the contributions expected from any participating NASA investigator and agency facilities or equipment which may be required. However, the proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals which purport to specify the internal arrangements NASA will actually make are not acceptable as a means of establishing an agency commitment.

## **11. Late Proposals**

A proposal or modification thereto received after the date or dates specified in an NRA may still be considered if the selecting official deems it to offer NASA a significant technical advantage or cost reduction.

## **12. Withdrawal**

Proposals may be withdrawn by the proposer at any time. Offerors are requested to notify NASA if the proposal is funded by another organization or other changed circumstances which dictate termination of evaluation.

## **13. Evaluation Factors**

a. Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

b. Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.



c. Evaluation of its intrinsic merit includes the consideration of the following factors, none of which is more important than any other:

(1) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal;

(2) The offeror's capabilities, related experience, facilities, techniques, or unique contributions of these which are integral factors for achieving the proposal objectives;

(3) The qualifications, capabilities, and experience of the proposed principal investigator, team leader or key personnel who are critical in achieving the proposals objectives;

(4) Overall standing among similar proposals available for evaluation and/or evaluation against the known state-of-the-art.

d. Evaluation of the cost of a proposed effort includes the consideration of the realism and reasonableness of the proposed cost and the relationship of the proposed cost to available funds.

#### **14. Evaluation Techniques**

Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases, however, proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house where NASA has particular competence; others are evaluated by a combination of in-house people and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. Regardless of the technique, the final decisions are always made by a designated NASA selecting official. A proposal which is scientifically and programmatically meritorious, but which is not selected for award during its initial review under the NRA may be included in subsequent reviews unless the proposer requests otherwise.

#### **15. Selection For Award**

a. When a proposal is not selected for award, and the proposer has indicated that the proposal is not to be held over for subsequent reviews, the proposer will be notified that the proposal was not selected for award. NASA will notify the proposer and explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.

b. When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation with the submitter. Formal RFP's are not used to obtain additional information on a proposal selected under the NRA process. However, the contracting officer may request certain business data and may forward a model contract and other information which will be of use during the contract negotiation.

## 16. Cancellation Of NRA

NASA reserves the right to make no awards under this NRA and , in the absence of program funding or for any other reason, to cancel this NRA by having a notice published in the Commerce Business Daily. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation. Cancellation may be followed by issuance and synopsis of a revised NRA, since amendment of an NRA is normally not permitted.

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**07/17/95**